

(No Model.)

2 Sheets—Sheet 1.

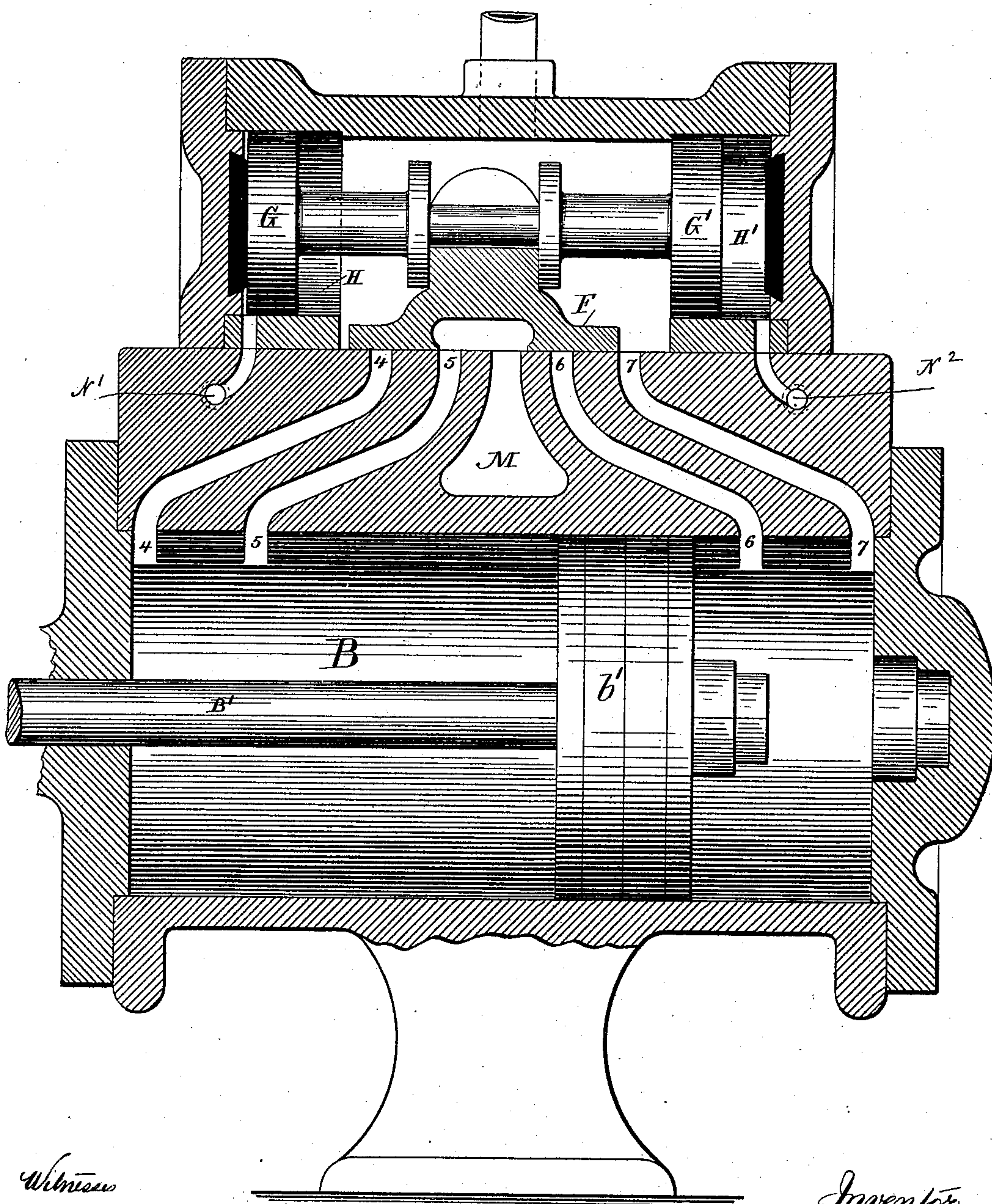
L. B. CARRICABURU.

STEAM ENGINE.

No. 321,084.

Patented June 30, 1885.

Fig. 1.



Witness

Chas H Smith
J. Stait

Inventor

Leon B. Carricaburu
per Lemuel W. Perrell atty

(No Model.)

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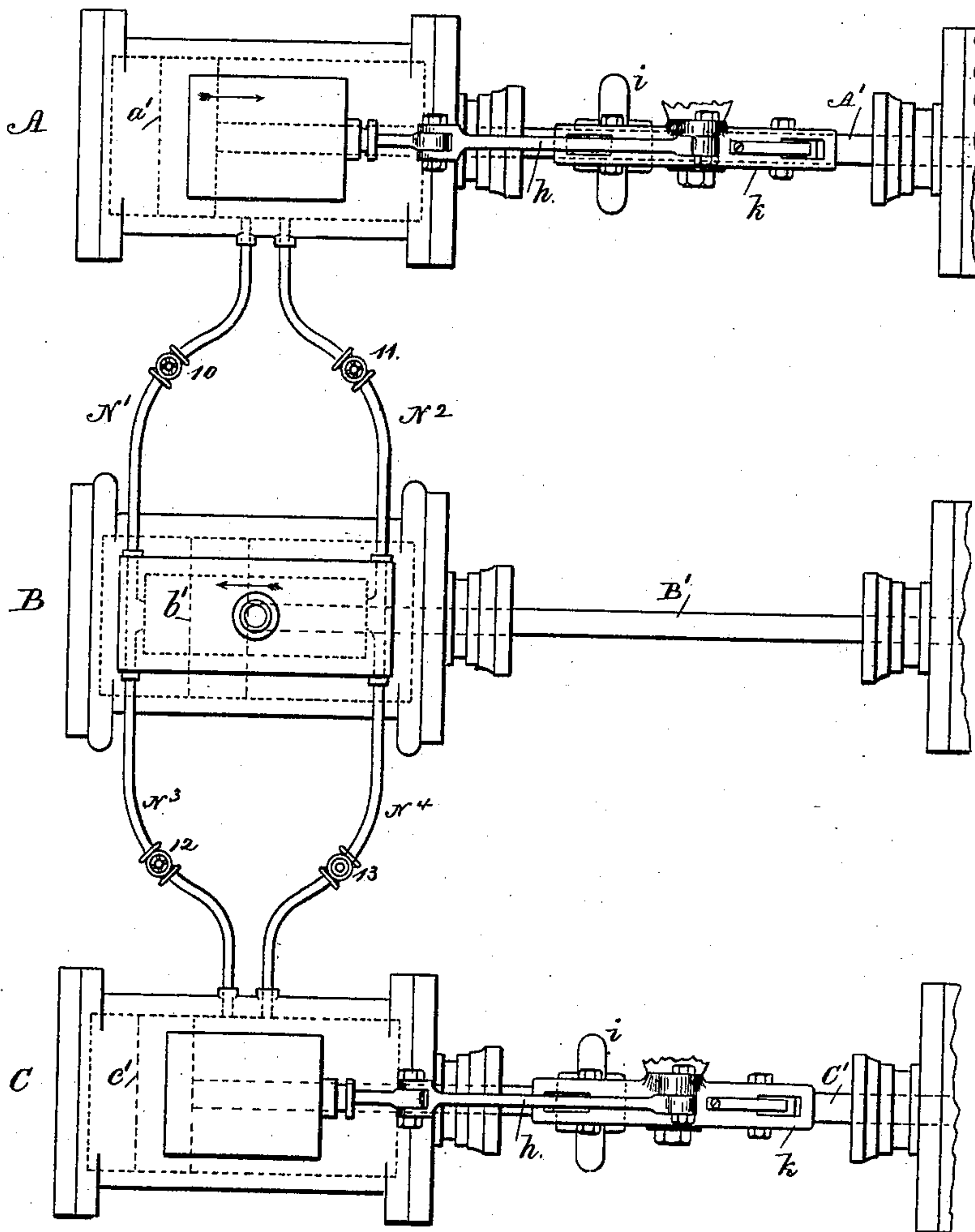
2 Sheets—Sheet 2.

STEAM ENGINE.

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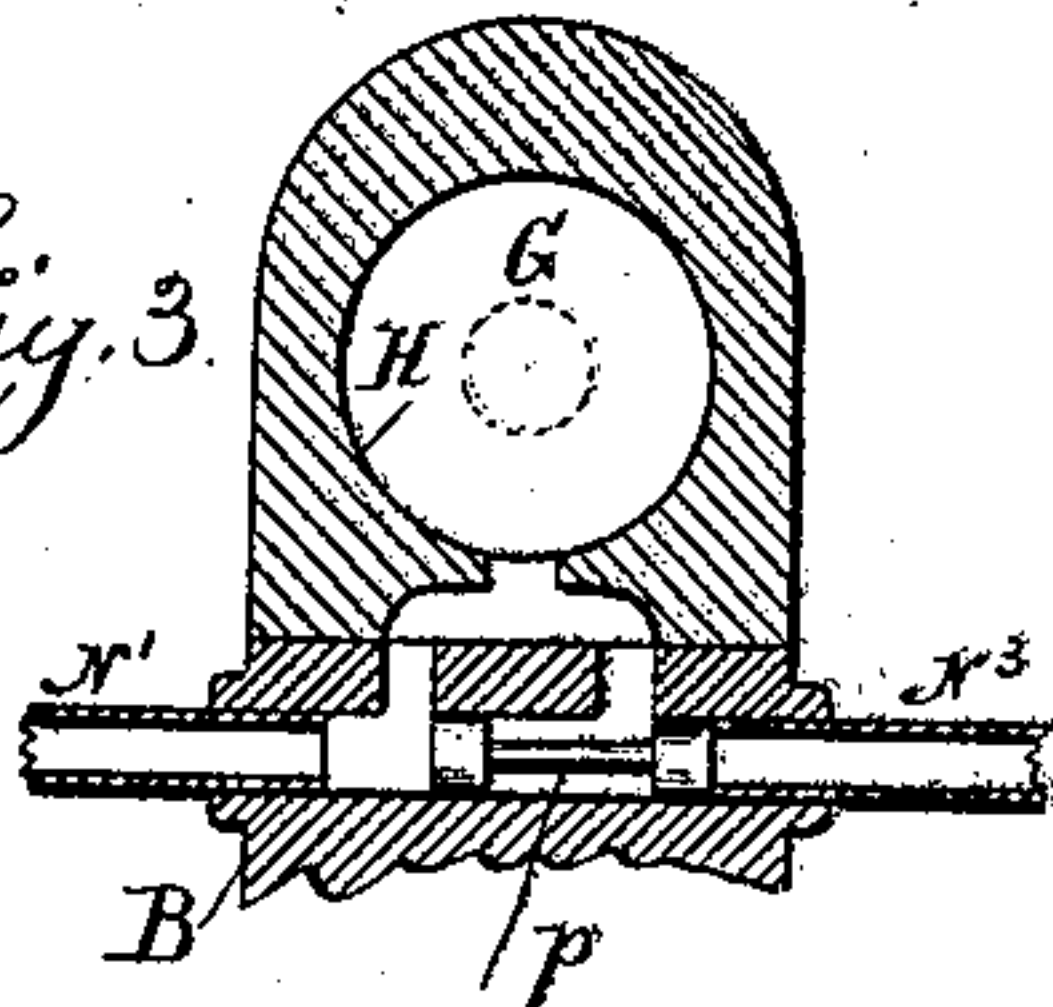
Fig. 2.



Witnesses

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Fig. 3.



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UNITED STATES PATENT OFFICE.

LEON B. CARRICABURU, OF NEW YORK, N. Y.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 321,084, dated June 30, 1885.

Application filed July 5, 1884. (No model.)

To all whom it may concern:

Be it known that I, LEON B. CARRICABURU, of the city and State of New York, have invented an Improvement in Steam-Engines, of which the following is a specification.

This invention relates to that class of engines in which one engine regulates the action of the other engine. Heretofore in direct-acting pumping-engines the movement of the piston-rod of one engine-cylinder has acted to give motion to the valve of the second cylinder, and the piston of the first cylinder has remained stationary until its valve has been moved by the tappets and piston-rod of the second cylinder, and so on. This, however, is detrimental, as there is but one piston in operation at a time, the one piston remaining quiescent during the stroke of the other piston. In my improvement the valve is moved by valve-moving pistons, which are actuated by steam admitted by the main piston of the adjacent engine when passing holes or openings in the side of the steam-cylinder. These holes or ports will usually be near the middle of the engine-cylinder, so that the piston of one engine will reach the end of its stroke at or about the same time as the piston of the other engine passes the middle of its stroke, and admits steam to move the valve of the first-named engine and cause the piston thereof to move in the other direction.

In the drawings, Figure 1 is a section of the engine and valve-moving pistons. Fig. 2 is a plan illustrating the connections between three steam-cylinders, and Fig. 3 is a cross section showing the automatic valve in the steamway.

The steam-cylinders A B C and their piston-rods A' B' C' and pistons a' b' c' may be of any desired size or construction. Usually the piston-rods will be extended to and act upon pistons in other cylinders, forming pumps; but the improvement may be used with engines for blowing or for any other object to which the same may be available. The cylinder B is shown with the ports 4, 5, 6, and 7, and the exhaust-port M, and the valve F, which receives its motion from the valve-moving pistons G G' in the cylinders H H'. The object attained by the use of the two pairs of ports 4 5 and 6 7 is that the valve covering the port 4 or 6 as the piston b' is moving toward that port

the other port, 5 or 6, is the only exhaust, and hence the vapors at the exhaust side of the piston are confined after the piston has passed the port 5 or 6 to form a cushion and prevent the piston striking against the cylinder-head. This feature of the two pairs of ports and the valve is shown in my application, Serial No. 118,152, filed January 21, 1884, and need not be further described.

I remark that my present invention is not limited to any particular valve or ports, and may be used with single ports to the respective ends of the cylinder, and with the ordinary D or B slide-valve, or with any other or known steam-engine valve that is capable of receiving motion from the valve-moving pistons. The engine-cylinder A is connected to the valve-moving cylinders H H', respectively, by the pipes N' N², in which there are cocks 10 and 11. The ends of the pipes at the cylinders H H' preferably open into holes made below the valve-seat, and provided with ports leading up into the respective cylinders. This avoids any direct connection to the cylinders H H', and allows for their removal from the valve-seat, when necessary, without disturbing the pipes N' N². At the cylinder A these pipes N' N² open by ports or holes through the cylinder itself, preferably at one side thereof, as shown by dotted lines in Fig. 2. The valve of the engine A may be moved by any desired mechanism. I have shown the rocker k and tappet i to act upon the valve-rod h, as in my application, Serial No. 118,151, filed January 21, 1884, and allowed April 22, 1884. When the piston of the cylinder A is moving in the direction indicated by the arrow, the ends of N' N², opening into the cylinder A, are both at the exhaust side of said piston, and as the piston passes along it covers the ends of both pipes N' N²; but the moment the end of N' is uncovered the steam under pressure rushes by N' into H, and moves the pistons G G' and valve F, admitting steam by the port 4, and opening the exhaust-port 6. While this movement is taking place the end of the pipe N² is covered by the piston, and the vapors in H' being confined act as a cushion to prevent concussion of the valve-moving piston G' against the head of its cylinder H'. There will be no movement of the valve-moving pis-

tons or valve in engine B until the piston in the cylinder A acts to cover and uncover the ends of the pipes $N' N^2$ in the reverse order to that before described, because the ends of $N' N^2$, being open in the cylinder A, the rise and fall of pressure or exhaust will act at opposite ends of the pistons $H H'$ equally, and the pistons and valve will remain stationary until the live steam is allowed to enter from the steam-cylinder A and upon either the piston H or the piston H' .

I have shown the three cylinders A B C. The cylinder C may be provided with the rocker k , for moving the valve in first one direction and then the other, the same as set forth in my aforesaid application No. 118,151, filed January 21, 1884, and by providing pipes $N^3 N^4$ between the cylinder C and the valve-moving pistons of the cylinder B, and cocks 12 and 13, the valve-moving devices of the engine B may be supplied with steam from the cylinder of C, instead of from the cylinder A, it being understood that when the valves 10 and 11 are open the valves 12 and 13 are to be shut, and vice versa.

If there is anything out of repair in the engine with the cylinder B, that may be isolated by closing the cocks 10 and 11, the cocks 12 and 13 also being closed, the engines C and A working independently; or the engine B can be controlled by steam admitted to its valve-moving devices by the piston of either the cylinder A or the cylinder C, thereby stopping only the engine which is out of order or is not desired to run, while in the duplex engine in use at present if one piston has to stop both have to stop. Usually, the cylinders A B C will be as close together as consistent with the introduction of the pipes and cocks.

In the drawings the cylinders are spread apart to illustrate the connections more clearly. If desired, the pipes $N' N^3$ or $N^2 N^4$, coming in from opposite sides into the metal below the valve-seat, may be in line with each other, as shown in Fig. 3, and provided with a sliding valve, p , between seats at the ends of the respective pipes, so that when steam is shut off from the cylinder A the pressure of steam from the cylinder C may throw the valves p over against the seats at the ends of the pipes $N' N^2$, closing the same; and when steam is shut off from the cylinder C and the steam admitted to the cylinder A the pressure may throw such valves p over upon the seats at the ends of the pipes $N^3 N^4$, closing the same. The valves p may be double, there being two on each stem, or the valves may be globular, so as to be rolled along by the pressure in the ports or passage-ways occupied by them. These valves p allow for the central engine being placed under control of either engine A or B by simply turning the steam on to start said engine A or B.

I do not claim duplex engines in which the steam passes from the cylinder of the first engine to move the valve of the second engine,

and in which steam from the second engine-cylinder passes to and moves the valve of the first engine. Neither do I claim two engines, either one of which can be operated independently of the other, and in which cocks are employed to the steam passage-ways, so that steam from the cylinder of one engine can be admitted to operate the valve of the other engine, the operation being reciprocal. In my improvements the engine B is entirely dependent upon the engine A or the engine C, and this engine B performs no duty for either of the other engines. I am therefore able to greatly simplify the construction and lessen the expense, and either engine A or C can be run alone; or they can both be operated at the same time, and the engine B can either be out of action or be controlled in its action by either the engine A or the engine C.

I claim as my invention—

1. The combination, with a steam-engine having a cylinder, piston, valve, and mechanism for moving the valve, of a second steam-engine, cylinder, piston, valve, and cylinders and pistons to move the steam-valve, and steam pipes or passages leading from the cylinder of the first engine to the cylinders and valve moving pistons of the second engine, whereby the first-named engine is entirely independent of the second engine, and the second engine is entirely dependent upon the first engine for the steam that moves its valve, substantially as specified.

2. The combination, with two steam-engines, A C, having independent valve-moving mechanism, of an intermediate steam-engine, B, having valve-moving pistons and cylinders, connecting steam-pipes from said cylinders of the valve-moving pistons to the steam-cylinders of the engines A C, and automatic valves in the steam passage-way of the engine B, substantially as specified.

3. The combination, with two steam-engines, A C, having independent valve-moving mechanism, of an intermediate steam-engine, B, having valve-moving pistons and cylinders, connecting steam-pipes from said cylinders of the valve-moving pistons to the steam-cylinders of the engines A C, and cocks or valves in the said pipes, substantially as specified.

4. The combination of three steam-engines, A B C, each having a cylinder, piston, piston-rod, and valve, with the connecting devices, substantially as set forth, whereby the valve of the engine B is dependent for its movement upon one of either the other two engines, and one or two of the engines can be stopped without interfering with the other engine or engines, substantially as specified.

Signed by me this 27th day of June, A. D. 1884.

L. B. CARRICABURU.

Witnesses:

GEO. T. PINCKNEY,
WILLIAM G. MOTT.